PATENT SPECIFICATION 710,102

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COMPLETE SPECIFICATION.

Improvements relating to Apparatus for Delivering Substances of High Viscosity.

We, THE ALBANY ENGINEERING COMPANY LIMITED, a Company registered under the Laws of Great Britain, of Lydney, Gloucestershire, and GEORGE EDMUND SWAFFIELD, British Subject, of the above Company's address, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for delivering controlled quantities of a substance that has a relatively high viscosity at normal room temperatures, for example a substance that is substantially solid at room temperatures.

According to one form of the present invention such apparatus comprises a hopper whose cross section decreases progressively from its upper to its lower end a pump of positive type adjacent the bottom of the hopper to receive the substance from it, means for heating the contents of the hopper comprising a heater element lying within the hopper and spaced from the hopper walls, and having a projection on its lower end which extends into the entrance of the pump, and a delivery pipe from the pump terminating in a discharge nozzle controlled by a pressure-responsive valve.

The invention is particularly, though not exclusively, applicable to lubricating apparatus for a machine working at an elevated temperature and requiring a lubricant that has a high viscosity at normal room temperature. For example the roll bearings of hot rolling steel mills are often lubricated with a lubricant known as "Hot Neck Grease" which solidifies at about 75° F. and at normal room temperatures may be broken into hard and brittle lumps.

[*Price* 2*s.* 8*d.*]

Thus a modification of the invention comprises the combination with a machine working at an elevated temperature and requiring a lubricant that has a high viscosity at normal room temperatures, of lubricating apparatus comprising a hopper whose cross section decreases progressively from its upper to its lower end, a pump of positive type adjacent the bottom of the hopper to receive the lubricant from it, means for heating the contents of the hopper comprising a heater element lying within the hopper and spaced from the hopper walls, and having a projection on its lower end which extends into the entrance of the pump, and a delivery pipe from the pump terminating in a discharge nozzle controlled by a pressure-responsive valve for delivering the lubricant to the part to be lubricated.

The invention may be carried into practice in various ways but one embodiment, as applied to apparatus for pumping "Hot Neck Grease" to the roll bearings of hot rolling steel mills, will be described by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation of the apparatus;

Figure 2 is an enlarged sectional side view of the hopper and pump shown in Figure 1; and

Figure 3 is an enlarged sectional view of one of the valve-controlled nozzles.

Hot rolling mills of the general type to which this embodiment of the invention is applied comprise two horizontal rollers which are mounted in bearings at each end and between which the hot steel plate or bar is passed. The temperature of the rollers may be extremely high, in some cases as high as 750° F., and it will be understood that normal lubricants are quite ineffective at such temperatures. The present practice

is to use for the purpose a lubricant known as "Hot Neck Grease" which although solid at normal room temperatures is comparatively efficient as a lubricant at such high working temperatures. This lubricant is expensive, and in order to introduce it into the bearings it has been customary to heat it over a stove and then to apply it with a mop or other hand tool, which is wasteful of time and labour. Moreover, due to the difficulties of this method of applying the lubricant there has been a danger of serious damage being caused to the mill owing to a lack of lubricant at the bearings.

It is an object therefore of this particular application of the invention to provide an improved apparatus for delivering lubricant to the bearings of such a rolling mill.

The apparatus comprises a steep angled conical hopper 1 with sides sloping at approximately 75° to the horizontal. The larger upper end is partly closed by a plate 2 and provided with a hinged flap 3 through which the lubricant may be supplied either in solid lumps or pre-heated to a liquid state, while the lower end of the hopper is connected direct to the inlet opening 4 of a pump 5. Mounted centrally within the hopper is a generally cylindrical heater element 6, which may be electrically heated or steam heated or heated in any other way as desired. The lower end of the heater 6 has a narrow conical tip 7 extending downwards through the narrow bottom end of the hopper into the inlet opening 4 of the pump, so as to restrict the cross-sectional area of the lower end of the hopper and thus to provide the maximum heating effect upon the lubricant near its point of exit from the hopper, while at the same time to a certain extent heating the pump itself. By raising or lowering the element 6 it is possible to vary the cross-sectional area of the outlet from the hopper, and thus the heating effect exerted at this point, to suit the viscosity of the substance which is to be pumped. The lower part 7 of the heating element 6 may be made hollow and may be filled with lead, bismuth, or other material having a high heat conductivity in order to aid the transference of heat.

The pump 5 is of the rotary gear type comprising two intermeshing gears 8 and 9 mounted to rotate in a pump casing, and in this particular arrangement the pump is manually operated, one of the gears being connected to a hand wheel 10 having spokes 11, under the control of the operator. If desired however the pump 5 may be power-operated through a reduction gear. The inlet opening 4 to the pump is made as large as possible both to facilitate the entry of the lubricant, and to accommodate the conical tip 7 of the heater element projecting downwards from the hopper. The internal end faces of the pump casing are provided with shallow recesses (not shown) to relieve the shock or percussion due to the pressure built up when the top of the tooth of one gear engages with the root of a tooth of the other gear. The outlet from the pump is connected by branch pipe connections 12 and 13 to four delivery nozzles 14 adjacent the bearings 15 of the two rollers 16, 17 of the mill, and each nozzle 14 is provided with a spring pressed ball valve as shown in Figure 3, the spring 18 of which urges the ball 19 into its closed position under an orifice 20 against any pressure which may exist in the pipe 12 or 13. The springs 18 may be adjusted by means of screw threaded nipples 21 and the nozzles may thus be arranged to deliver quantities of lubricant approximately simultaneously at the four bearings 15 whenever the pump 5 is operated, and to shut off the supply of lubricant whenever the pressure in the pipe connections 12 and 13 drops below a certain level as for example when the pump is operated in reverse.

In this particular arrangement no apparatus is provided specially to heat the pump 5, nozzles 14 and pipe connections 12 and 13 owing to the fact that the air temperature in the vicinity of the mill when operating seldom falls below about 135° F. which is above the melting point of the lubricant, and it is therefore only necessary to provide the heating apparatus 6 at the hopper 1 and adjacent the inlet to the pump 5. At the start of a "run" however it may be necessary to heat the pump and other parts of the apparatus, for example with a blow-lamp, in order to free any solidified lubricant which may remain within the apparatus.

In other applications where the room temperature is not high enough to maintain the pump, pipe connections and nozzles above the solidifying temperature of the substance being pumped it will be necessary to provide heating apparatus for the parts, which may be in the form of steam or other heated jackets, or internal or external electrically heated elements.

If necessary one or more agitators may be provided within the hopper to break up the solid masses of lubricant and resist the melting process, and also to aid the downward flow of lubricant into the pump. Such an agitator may be in the form of an eccentrically mounted rotary head driven by an electric motor mounted at the upper end of the hopper, while in another form the agitator may comprise a spiral bladed worm conveyor having a clear central gap to accommodate the central heater element.

The apparatus and its component parts may be constructed in any suitable materials to resist the action of corrosive substances,

and if desired, the whole apparatus may be made portable.

To further lessen the difficulties of handling the "Hot Neck Grease", mobile charging units may be provided in which this lubricant is pre-heated and pumped through a flexible pipe into the hopper of the delivery apparatus.

What we claim is:—

1. Apparatus for delivering controlled quantities of a substance of high viscosity at room temperatures comprising a hopper whose cross section decreases progressively from its upper to its lower end, a pump of positive type adjacent the bottom of the hopper to receive the substance from it, means for heating the contents of the hopper comprising a heater element lying within the hopper and spaced from the hopper walls, and having a projection on its lower end which extends into the entrance of the pump, and a delivery pipe from the pump terminating in a discharge nozzle controlled by a pressure-responsive valve.

2. Lubricating apparatus for a machine working at an elevated temperature and requiring a lubricant of high viscosity at room temperatures comprising a hopper whose cross section decreases progressively from its upper to its lower end, a pump of positive type adjacent the bottom of the hopper to receive the lubricant from it, means for heating the contents of the hopper comprising a heater element lying within the hopper and spaced from the hopper walls, and having a projection on its lower end which extends into the entrance of the pump, and a delivery pipe from the pump terminating in a discharge nozzle controlled by a pressure-responsive valve for delivering the lubricant to the part to be lubricated.

3. The combination with a machine working at an elevated temperature and requiring a lubricant that has a high viscosity at normal room temperatures, of lubricating apparatus comprising a hopper whose cross section decreases progressively from its upper to its lower end, a pump of positive type adjacent the bottom of the hopper to receive the lubricant from it, means for heating the contents of the hopper comprising a heater element lying within the hopper and spaced from the hopper walls, and having a projection on its lower end which extends into the entrance of the pump, and a delivery pipe from the pump terminating in a discharge nozzle controlled by a pressure-responsive valve for delivering the lubricant to the part to be lubricated.

4. Lubricating apparatus substantially as specifically described with reference to the accompanying drawings.

KILBURN & STRODE,
Agents for the Applicants.

PROVISIONAL SPECIFICATION.

Improvements relating to Apparatus for Delivering Substances of High Viscosity.

We, THE ALBANY ENGINEERING COMPANY LIMITED, a Company registered under the Laws of Great Britain, of Lydney, Gloucestershire, and GEORGE EDMUND SWAFFIELD, British Subject, of the above Company's address, do hereby declare this invention to be described in the following statement:—

This invention relates to apparatus for delivering controlled quantities of a substance that has a relatively high viscosity at normal room temperatures, for example a substance that is substantially solid at room temperatures.

According to one form of the present invention such apparatus comprises a hopper to receive the substance, means for heating the contents of the hopper, a pump of positive type adjacent the bottom of the hopper to receive the substance from it, and a delivery pipe from the pump terminating in a discharge nozzle controlled by a pressure-responsive valve.

The invention is particularly, though not exclusively, applicable to lubricating apparatus for a machine working at an elevated temperature and requiring a lubricant that has a high viscosity at normal room temperatures. For example the roll bearings of hot rolling steel mills are often lubricated with a lubricant known as "Hot Neck Grease" which solidifies at about 75° F. and at normal room temperatures may be broken into hard and brittle lumps.

Thus a modification of the invention comprises the combination with a machine working at an elevated temperature and requiring a lubricant that has a high viscosity at normal room temperatures, of lubricating apparatus comprising a hopper for the lubricant, means for heating the contents of the hopper, a pump of positive type adjacent the bottom of the hopper to receive the lubricant from it, and a delivery passage from the pump to the part to be lubricated.

Preferably the means for heating the hopper extends into the passageway leading

from the hopper to the pump. The heating means, which may be arranged centrally within the hopper, are preferably arranged to exert their maximum heating effect near the lower end of the hopper.

The walls of the hopper should generally slope down comparatively steeply, for example at an angle to the horizontal not less than about 60° and preferably about 75°.

The invention may be carried into practice in various ways but one embodiment, as applied to apparatus for pumping "Hot Neck Grease" to the roll bearings of hot rolling steel mills, will be described by way of example.

Hot rolling mills of this general type comprise two horizontal rollers which are mounted in bearings at each end and between which the hot steel plate or bar is passed. The temperature of the rollers may be extremely high, in some cases as high as 750° F., and it will be understood that normal lubricants are quite ineffective at such temperatures. The present practice is to use for the purpose a lubricant known as "Hot Neck Grease" which although solid at normal room temperatures is comparatively efficient as a lubricant at such high working temperatures. This lubricant is expensive, and in order to introduce it into the bearings it has been customary to heat it over a stove and then to apply it with a mop or other hand tool, which is wasteful of time and labour. Moreover, due to the difficulties of this method of applying the lubricant there has been a danger of serious damage being caused to the mill owing to a lack of lubricant at the bearings.

It is an object therefore of this particular application of the invention to provide an improved apparatus and method of delivering lubricant to the bearings of such a rolling mill.

The apparatus comprises a steep angled conical hopper with sides sloping at approximately 75° to the horizontal. The larger upper end is partly closed by a plate and provided with a hinged flap through which the lubricant may be supplied either in solid lumps or pre-heated to a liquid state, while the lower end of the hopper is connected direct to the inlet opening of a pump. Mounted centrally within the hopper is a generally cylindrical heater element, which may be electrically heated or steam heated or heated in any other way as desired. The lower end of the heater has a narrow conical tip extending downwards through the narrow bottom end of the hopper into the inlet opening of the pump, so as to restrict the cross-sectional area of the lower end of the hopper and thus to provide the maximum heating effect upon the lubricant near its point of exit from the hopper, while at the same time to a certain extent heating the pump itself. By raising or lowering the element it is possible to vary the cross-sectional area of the outlet from the hopper, and thus the heating effect exerted at this point, to suit the viscosity of the substance which is to be pumped. The lower part of the heating element may be made hollow and may be filled with lead, bismuth, or other material having a high heat conductivity in order to aid the transference of heat.

The pump is of the rotary gear type comprising two intermeshing gears mounted to rotate in a pump casing, and in this particular arrangement the pump is manually operated, one of the gears being connected to a hand wheel under the control of the operator. If desired the pump may be power-operated through a reduction gear. The inlet opening to the pump is made as large as possible both to facilitate the entry of the lubricant, and to accommodate the conical tip of the heater element projecting downwards from the hopper. The internal end faces of the casing are provided with shallow recesses to relieve the shock or percussion due to the pressure built up when the top of the tooth of one gear engages with the root of a tooth of the other gear. The outlet from the pump is connected by branch connections and pipes to four delivery nozzles adjacent the bearings of the rollers of a mill, and each nozzle is provided with a spring pressed ball valve the spring of which urges the ball into its closed position against any pressure which may exist in the pipe. The springs may be adjusted and the nozzles may thus be arranged to deliver quantities of lubricant approximately simultaneously at the four bearings whenever the pump is operated, and to shut off the supply of lubricant whenever the pressure in the pipe connections drops below a certain level as for example when the pump is operated in reverse.

In this particular arrangement no apparatus is provided specially to heat the pump, nozzles and pipe connections, owing to the fact that the air temperature in the vicinity of the mill when operating seldom falls below about 135° F. which is above the melting point of the lubricant, and it is therefore only necessary to supply heating apparatus at the hopper and adjacent the inlet to the pump. At the start of a "run" however it may be necessary to heat the pump and other parts of the apparatus, for example with a blow-lamp, in order to free any solidified lubricant which may remain within the apparatus.

In other applications where the room temperature is not high enough to maintain the pump, pipe connections and nozzles above the solidifying temperature of the substance being pumped it will be necessary to provide

heating apparatus for these parts, which may be in the form of steam or other heated jackets, or internal or external electrically heated elements.

If necessary one or more agitators may be provided within the hopper to break up the solid masses of lubricant and resist the melting process, and also to aid the downward flow of lubricant into the pump. Such an agitator may be in the form of an eccentrically mounted rotary head driven by an electric motor mounted at the upper end of the hopper, while in another form the agitator may comprise a spiral bladed worm conveyor having a clear central gap to accommodate the central heater element.

The apparatus and its component parts may be constructed in any suitable materials to resist the action of corrosive substances, and if desired the whole apparatus may be made portable.

To further lessen the difficulties of handling the "Hot Neck Grease", mobile charging units may be provided in which this lubricant is pre-heated and pumped through a flexible pipe into the hopper of the delivery apparatus.

KILBURN & STRODE,
Agents for the Applicants.

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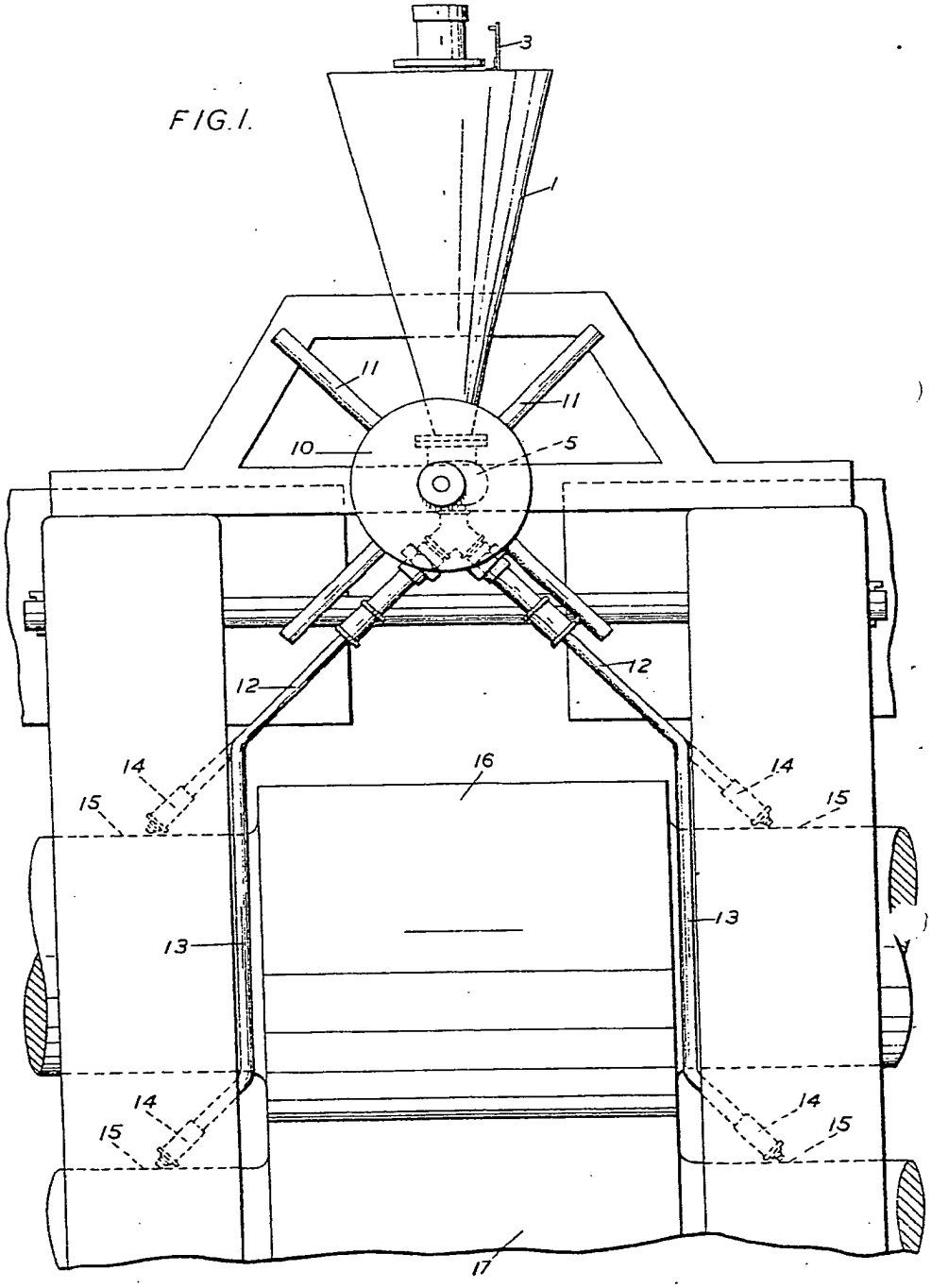
FIG. 1.



710,102 COMPLETE SPECIFICATION

2 SHEETS

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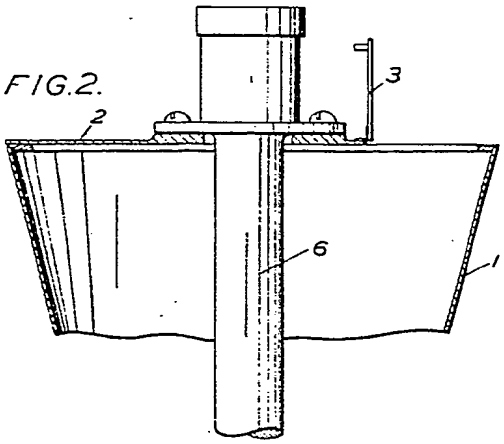
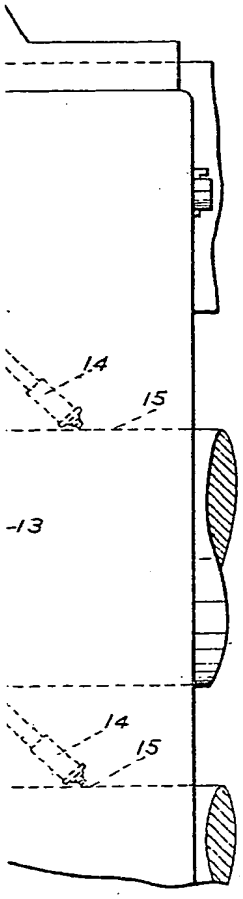
SHEETS 1 & 2

FIG.2.





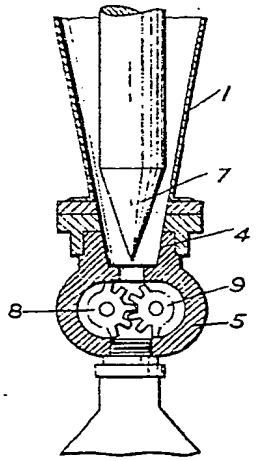
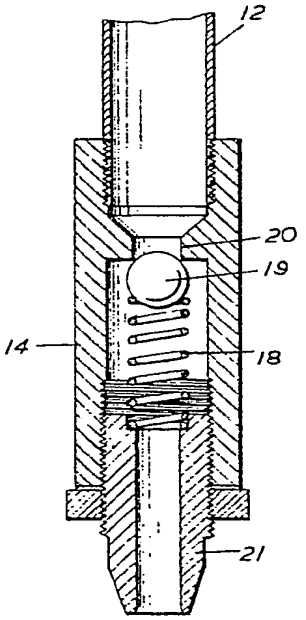


FIG.3.



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SHEETS 1 & 2

FIG.1.

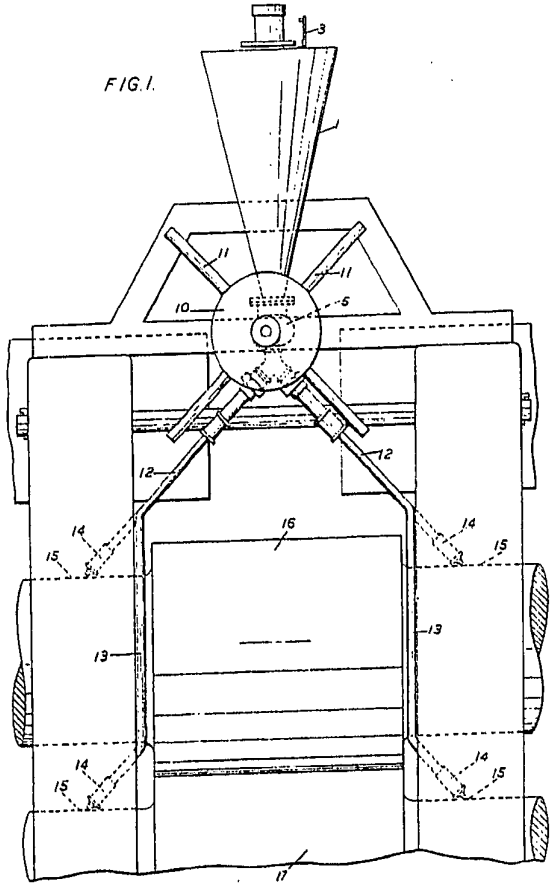

FIG.2.

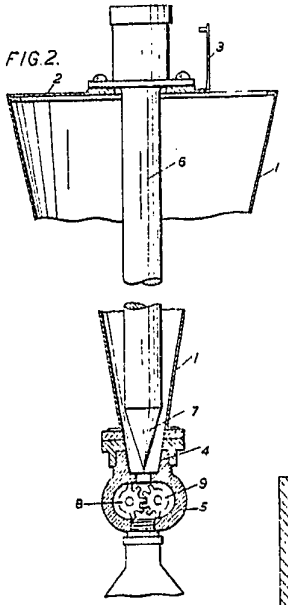

FIG.3.